U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN No. 111.

The Farmer's Interest in Good Seed.

BY

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WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1900.

LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., January 11, 1900.

SIR: I have the honor to transmit herewith a manuscript by Mr. A. J. Pieters, in charge of the pure-seed investigations of this Department, entitled "The Farmer's Interest in Good Seed," and to recommend its publication as a Farmers' Bulletin. It is universally recognized by agriculturists that the use of poor seed causes a loss of millions of dollars annually, either directly or indirectly, to American farmers. From the many thousand tests made by the Department in the last six years a number have been selected which show the very wide range in quality of seeds secured in the retail market. In each case the percentage of good seed in the sample has been determined and an estimate made of the price really paid for this good seed by the farmer. The results are significant. A farmer who paid $3.50 for a bushel of clover seed, which, though weighing 60 pounds, was found to contain only 27¾ pounds of good seed, was in reality paying at the rate of $7.57 per bushel for his seed. *The only way to ascertain the real value of seeds is for the farmer to test them himself or to have them tested elsewhere.* In the present bulletin is included a statement of the means by which such tests may be secured.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

Hon. JAMES WILSON,
Secretary of Agriculture.

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INTRODUCTION.

The successful farmer of to-day is on the alert for improved methods and machinery, better varieties, and the prevention of unnecessary waste. While many of the dangers to crops can not be avoided, it may be possible by care and foresight to keep clear of some which are commonly unnoticed. One of the controllable factors, and the one which is perhaps most often neglected, is the seed.

POOR SEEDS AND MEANS OF PROTECTION FROM THEM.

For the last three or four years there has been a constantly increasing outcry against the seeds sold by unscrupulous dealers, and some demand for legislation. A few States have passed, or have attempted to pass, laws regulating the trade in seeds. This serves to show that in some places the farmers are alive to the injury done by the sale of foul or poor seeds and are searching for a remedy. As yet, however, there is no indication that the mass of farmers realize the extent of the evil or see clearly how the sale of poor seed affects them personally. That there are many frauds in the seed trade no good seedsman will deny, but much of the complaint about poor seed is due to the fact that dealers themselves are ignorant of the quality of the seeds they sell. The solution of the difficulty lies with the consumers; if they will demand a statement of quality, and purchase only from firms willing and able to give a reliable statement, and if they will pay what good seed is worth, they will get good seed; if they continue to buy haphazard, they must take their chances.

SEED TESTING, AND THE FEATURES OF POOR SEED.

The purpose of this bulletin is, besides calling attention to this question in a general way, to give the results of many tests made in the seed laboratory of the Department, and to make some suggestions tending toward the betterment of agricultural seeds. Except wheat, corn, and oats, the seeds of grasses and clovers are most largely used by farmers, and these are also the most frequently impure, adulterated, or dead. It is true that much poor vegetable seed is sold, but in this case the question of genuineness of variety is of chief importance, and to determine this before the seed is planted is impossible. But with grasses and clovers the case is different; the exact value of the seed can be determined long before planting, and there is no good reason why this should not be done.

Three charges may be preferred against poor seed, any one of which

ought to be sufficient to condemn it, while usually all three can be proved.

1. The seed will fail to grow, or if it grows will give an uneven stand.

2. In case of grass or clover seed, it contains weed seeds, and will sometimes bring an entirely new weed to the farm.

3. Poor seed costs more than it is worth.

RELATION BETWEEN QUALITY OF SEED AND AMOUNT TO SOW PER ACRE.

The amount of seed to sow per acre is regulated by more or less well-defined rules, based upon general experience and varying somewhat locally. Thus, it is said that 3 bushels per acre should be planted of redtop, orchard grass, and English rye grass; one-half to 1 bushel of timothy; and 10 to 15 pounds of clover. These rules, however, do not take into consideration the quality of the seed used. Assuming, for example, that 3 bushels of first quality seed is meant, then an increased amount should be sown when an inferior seed is used. The standard weight for orchard grass is 14 pounds per bushel and of this, according to our tests, $8\frac{2}{10}$ pounds consists of pure seed that will grow, the remainder being chaff, dead seeds, and weed seeds. If now the seed purchased has a lower germination, say, 50 per cent instead of 80 per cent, then there will be only a little more than $5\frac{1}{2}$ pounds of pure and good seed in every bushel. Again, if the amount of chaff is greater, there may be only a little more than $3\frac{1}{2}$ pounds of pure and good seed in every bushel. Three bushels of standard orchard grass seed, weighing 14 pounds to the bushel, contain $25\frac{4}{5}$ pounds of good seed; therefore if a similar stand is desired from seed of the same weight but lower germination, say 50 per cent, as above, nearly 5 bushels per acre must be sown, while of seed weighing 12 pounds per bushel and germinating 50 per cent, $6\frac{1}{4}$ bushels will be needed. On the other hand, if high-grade seed weighing $16\frac{3}{4}$ pounds per bushel and germinating 90 per cent is used, there will be over 14 pounds of good seed to the bushel, and less than $1\frac{3}{4}$ bushels need be used. It is clear from this that the little knowledge one gets of a sample of seed by passing a handful through his fingers is not a sufficient basis for a correct judgment of the amount to sow. A uniform stand under these conditions is secured only by chance. Seed may fail to come up if thus carelessly selected, though every care has been taken with the preparation of the land. In this case failure, with consequent loss of the cost of seed, of labor, and of the use of the land, could have been avoided by testing for germination before planting.

WEED SEEDS SOWN ON THE FARM.

One of the ways in which weed seeds are most widely distributed is by being sown along with agricultural seeds. The number of weed seeds sown every year in this way is astonishing. What makes the matter worse is that they are usually sown with grass or clover, crops

that are not cultivated and in which, accordingly, the weeds remain unmolested long enough to get a good foothold. Some samples of seed contain such a small amount that they would be considered practically pure, but even in these the number of weed seeds in a pound is surprisingly large. In one sample that contained in all only one-fifth of 1 per cent of spurious seeds the number of weed seeds per pound averaged about 990. In a bushel of 60 pounds there were, therefore, more than 59,000 weed seeds. A sample containing four-fifths of 1 per cent of spurious seeds had about 3,000 weed seeds per pound, while in another sample in which 2.5 per cent was spurious seed there were more than 27,600 weed seeds in every pound. If 15 pounds were sown to the acre, the farmer distributed about 414,000 seeds of weeds, all of which had an equal chance with the crops among which they grew. The first two samples mentioned would be regarded everywhere as good seed and the last would not generally be considered very bad. Sometimes, however, clover-seed tailings are used on the farm, while the cleaned seed goes to market. Such tailings have been found to contain nearly 272,500 weed seeds per pound. A sample of clover seed offered on the Chicago market about two years ago for 2 cents per pound contained about 338,300 weed seeds per pound, or more than 20,000,000 per bushel. While the presence of weeds in cultivated fields may not be a wholly unmixed evil since they compel the stirring of the soil, their intrusion into meadows and pastures has not even this advantage. Here they crowd out better plants, thus decreasing the value of the hay, and are at all times difficult to control.

LOW-PRICED SEED MAY BE EXPENSIVE.

While it is difficult to estimate the money loss chargeable to poor seed on account of extra labor, loss of the use of land, and the introduction of weed seeds, it is easy to determine the exact loss due to the quality of the seed itself, reckoned on the increased price for the seeds that actually come up and grow.

A sample of seed may contain:

1. Pure and germinable seed, that is, seed that will grow and produce the kind of plants wanted.
2. Chaff, sticks, and dirt.
3. Dead seeds of the kind purchased.
4. Weed seeds, and field seeds other than those wanted.

Of these the pure and good seed only is of any value, the remainder being either useless or positively harmful. The value of the sample to the farmer will depend, then, upon the amount of pure and germinable seed present. It is for this that the farmer pays, and whether the seed is cheap or expensive depends not solely upon whether it is low or high priced, but upon how much he pays per pound of good seed. The term "Actual or net value" is used in seed-testing establishments to indicate the proportion of seed that is both pure and germinable. For example, if a sample of clover seed has 98 per cent of pure seed

and 90 per cent of this will germinate, then the proportion of good clover seed in the entire sample is 90 per cent of 98 per cent, or 88.2 per cent. This represents the net value of the seed, and in a scale of 100 the sample is said to have a net value of 88.2. The standard weight of a bushel of red clover is 60 pounds, and a sample having a net value of 88.2 will contain 52.9 pounds, of good seed. The net value of the seed sold on the market varies widely, and there is no constant relation between cost and value.

RESULTS OF SOME TESTS.

RED CLOVER, Trifolium pratense.

Five of the samples of red clover in the following table were fairly good seed, but the price was not always proportionate to the real value. Samples 2 and 7, though inferior seed, were really the most expensive, while for sample 6 less was paid per pound of good seed than for any of the others. Most of these samples were purchased in the same place and two of them, Nos. 1 and 3, from the same dealer. They illustrate how little local dealers regulate prices according to the real value of the seed.

TABLE 1.—*Comparison of market price of clover seed with price actually paid for the good seed.*

Sample number.	Market price per bushel (60 pounds).	Per cent of good seed.	Number pounds good seed per bushel.	Price paid per bushel of good seed
1	$5.50	93	55.8	$5.88
2	5.25	76.2	45.72	6.90
3	5.00	92	55.2	5.40
4	4.75	93	55.8	5.10
5	4.75	80.1	48	5.94
6	4.00	87.3	52.38	4.59
7	3.50	46.2	27.72	7.56

In this table the cost of the seed has been reduced to cost per bushel of good seed. A consideration of the table shows that neither the highest nor the lowest priced sample was the cheapest. The lowest-priced lot, No. 7, cost more per bushel of good seed than any other, while lot No. 6 was the best one to buy because it sold for the lowest price per bushel of good seed. If this lot had contained the seeds of injurious weeds that fact would have had to be taken into consideration when judging of its value. The presence of dodder even in small amounts should condemn any sample of clover or alfalfa, no matter how good it may otherwise be, and the presence of more than 1 per cent of weed seeds will take far more than 1 per cent from the value of the sample. The important point is that the value of clover seed should be judged, not by its price per bushel, but by its price per pound or bushel of pure and germinable seed.

Fig. 1 illustrates the amount of good seed and waste in a pound of a commercial sample costing $3.50 per bushel, This is the same sample

as No. 7 of table 1, and contained nearly 39 per cent of yellow trefoil seed. As shown by No. 5 of the figure, more than one-half of the total was waste, or worse, making the actual cost of the good seed more than double the amount supposedly paid for it.

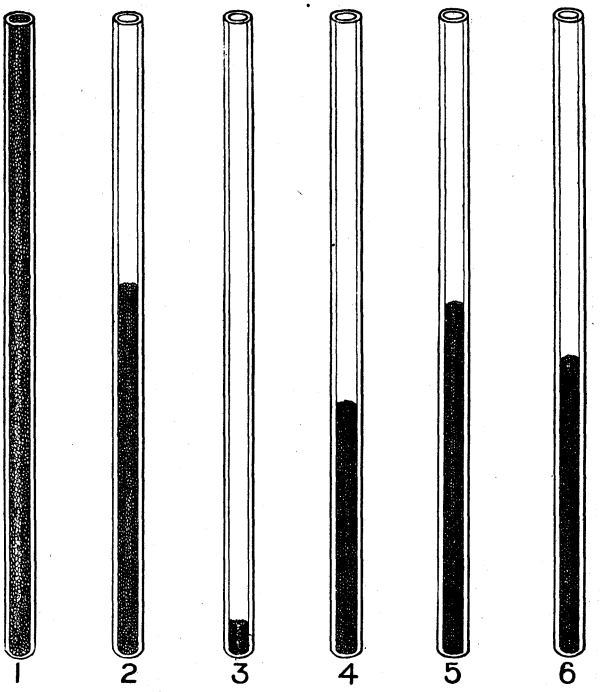

FIG. 1.—Red Clover (*Trifolium pratense*): 1, one pound of seed as bought; 2, pure seed; 3, broken seed and dirt; 4, spurious seeds; 5, total waste; 6, pure and germinable seed.

REDTOP, Agrostis alba.

Grass seeds are less understood and are more apt to be poor than any other farm seeds, and many cases that have come under the writer's observation forcibly illustrate the danger of buying untested grass seed. The following table gives the results of a few tests of redtop. It shows that the highest-priced seed was far the cheapest, while sample 2, the price of which was a little more than one-fifth as great as sample 1, really cost five times as much.

TABLE 2.—*Comparison of market price of redtop seed with price actually paid for the good seed.*

Sample number.	Market price per bushel.	Per cent of good seed.	Number pounds good seed per bushel	Price paid per pound.	Price paid per pound of good seed.
				Cents.	*Cents.*
1	$5.00	77.4	28.25	13.7	17.7
2	1.10	10.48	1.34	8.54	81.3
3	.75	16.76	2.44	5.37	30.7

Sample No. 2, which was sold for $1.10, weighed 12.87 pounds per bushel, and every pound of good seed cost 81.3 cents, or more than four and one-half times as much as No. 1, which brought $5 per bushel of 36.5 pounds.

FIG. 2.—Red top (*Agrostis alba*): 1, one pound of seed as bought; 2, pure seed; 3, chaff and dirt; 4 spurious seeds; 5, total waste; 6, pure and germinable seed.

Fig. 2 illustrates the amount of good seed and waste in 1 pound of a commercial sample costing $1.10 per bushel. This is the same sample as No. 2 of the table. The price paid was at the rate of 8.54 cents per pound, and No. 6 of the figure shows how much good seed a pound contained. The actual price per pound of good seed was 81.3 cents.

KENTUCKY BLUE-GRASS, Poa pratensis.

The following tests of Kentucky blue-grass also show that the market price of seed may have no relation to its real value.

TABLE 3.—*Comparison of market price of blue grass seed with price actually paid for the good seed.*

Sample number.	Price paid per pound.	Per cent of good seed.	Number pounds good seed per bushel.	Price paid per pound of good seed.
	Cents.			
1	14	60.82	12.16	$0.23
2	10.23	5.84	.627	1.75
3	10	.46	.064	2.18
4	6.25	25.88	3.62	.24

In sample 3 the purity was good, but the germination was very poor, and the seed cost more than nine times as much as sample 1. Sample 4, although inferior seed, was sold at so low a price that the price per pound of available seed was but little more than for sample 1.

Fig. 3 illustrates the amount of good seed and the waste in one pound of a commercial sample costing 10.23 cents. This is the same sample as No. 2 of Table 3. No. 6 of the figure shows how little good seed there was. The actual price per pound of good seed was $1.75.

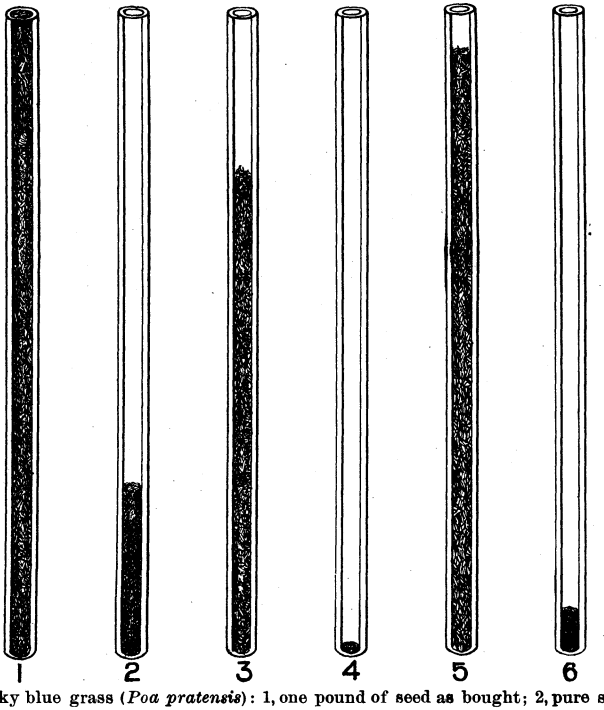

FIG. 3.—Kentucky blue grass (*Poa pratensis*): 1, one pound of seed as bought; 2, pure seed; 3, chaff and dirt; 4, spurious seeds; 5, total waste; 6, pure and germinable seed.

TIMOTHY, Phleum pratense.

Timothy seed presents less opportunity for adulteration than any other grass seed. It is usually pure and germinates well when fresh. Old seed is, however, sometimes sold, and this may be a total loss to the purchaser.

TABLE 4.—*Comparison of market price of timothy seed with price actually paid for the good seed.*

Sample number.	Market price per bushel.	Per cent of good seed.	Number pounds good seed per bushel.	Price paid per bushel of good seed.
1	$1.60	98.75	44.4	$1.62
2	1.40	83.16	37.4	1.68
3	1.35	2.19	1.28	47.25

Sample 3 was as pure as the others, but mostly failed to germinate, and was therefore nearly worthless. Its price per bushel of good seed was $47.25. The other samples, although differing in net value, also differed in price, so that the net cost was nearly the same. Even when the percentage of purity and germination is fair or good the character of the weed seeds present should receive attention. The hawksbeard (*Crepis taraxifolia*), which has become such a pest in Oregon, is said to have been introduced with timothy seed. Seeds of a species of dodder are sometimes found in timothy seed, and should be especially guarded against.

ORCHARD GRASS, Dactylis glomerata.

Orchard grass is one of our principal grasses, and a large amount of the seed is sold every year. Some dealers have sold orchard-grass

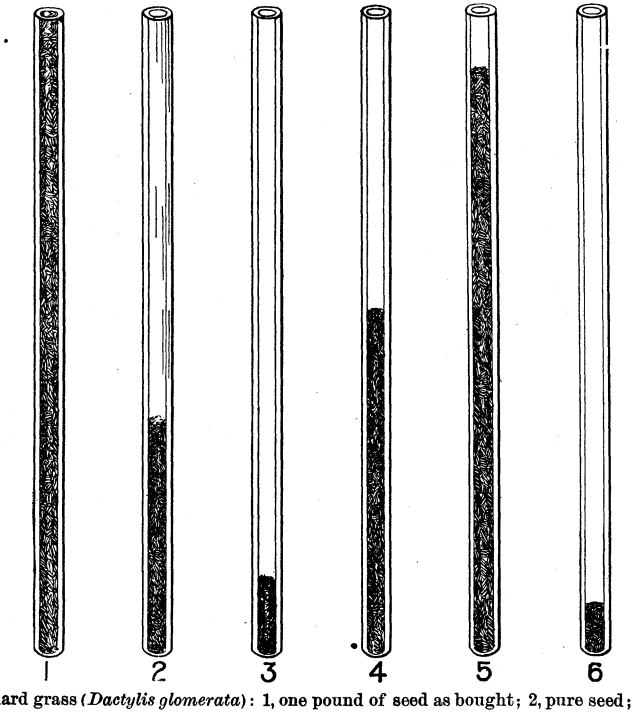

FIG. 4.—Orchard grass (*Dactylis glomerata*): 1, one pound of seed as bought; 2, pure seed; 3, chaff and dirt; 4, spurious seeds; 5, total waste; 6, pure and germinable seed.

seed that had been adulterated with meadow-fescue seed. Possibly they did not know it, but that does not alter the fact that the farmer had to pay for seed which he did not want.

Sample No. 3, Table 5, was badly adulterated with meadow-fescue seed, and the purchaser had to pay an exorbitant price per pound of good seed. No. 5, which appeared to be cheap, really cost the purchaser twice as much as No. 1.

TABLE 5.—*Comparison of market price of orchard-grass seed with price actually paid for the good seed.*

Sample number.	Market price per bushel.	Per cent of good seed.	Number pounds good seed per bushel.	Price paid per bushel of good seed.
1	$2.10	74.65	12.5	$2.35
2	1.50	59.2	9.17	2.28
3	1.50	24.92	3.55	5.85
4	1.25	46.87	6.55	2.66
5	.80	16.86	2.36	4.74

Fig. 4 illustrates the amount of good seed and waste in 1 pound of a commercial sample. More than half by weight consisted of meadow-fescue seed, and of the remainder so little germinated that only about 6 per cent of the amount purchased was fit to use.

BEARDLESS BROME GRASS, Bromus inermis.

Beardless brome grass is coming into great favor throughout the West and the seed is in demand. This not only makes the price high, but leads to the sale of chaffy and adulterated seed. The standard weight is 14 pounds per bushel, and most seedsmen quote prices either "per 100 pounds" or "per bushel of 14 pounds." We have secured pound packages from all seedsmen cataloguing this seed and have not found one lot that weighed more than 13 pounds. Most of the samples weighed 11 or 11¼ pounds per bushel, while one sample fell to 8¼ pounds. Buyers should insist on good seed of standard weight. At present most of this seed is imported, but some American-grown seed has been sold, and tests show that both in purity and germination it is far superior to the imported seed.

TABLE 6.—*Comparison of market price of beardless brome grass seed with price actually paid for good seed.*

Sample number.	Price paid per pound. *a*	Per cent of good seed.	Number of pounds good seed per bushel.	Price paid per pound of good seed.
	Cents.			*Cents.*
1	20	0	0	.....
2	18	63.8	7	28.2
3	16	68.4	8.38	23.4
4	16	56.5	6.21	28.3
5	15	35.6	4.6	41
6	14	22.1	2.48	63.6
7	11.9	27.4	3.22	43.4
8	10	20.8	1.71	48
9	10	87.3	12.2	11.4

a In 100-pound lots except No. 9, which was in 1,000-pound lots.

No. 1 of the table was tested with other samples, but not a grain germinated. The purchaser of this seed lost whatever he paid. Sample 9 was raised in the United States and would have been cheapest even at double the price.

Fig. 5 illustrates the amount of good seed and waste in 1 pound of a commercial sample. This seed contained more than 40 per cent of chess and less than 16 per cent of the total could be used, the balance being waste.

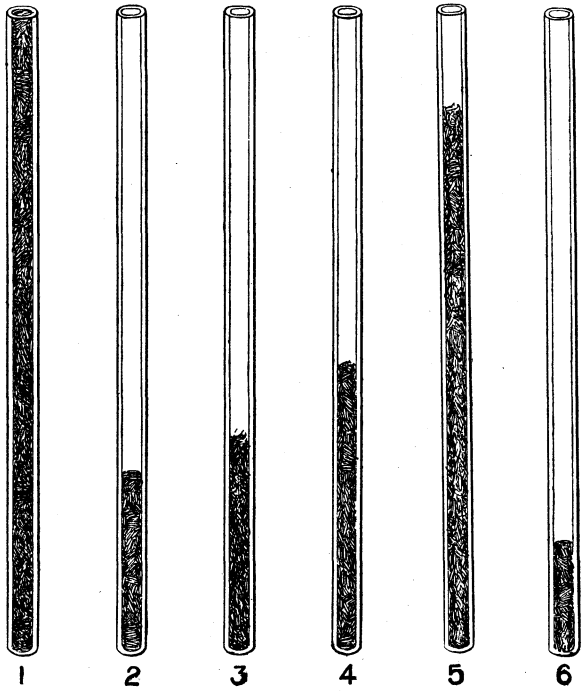

FIG. 5.—Beardless brome grass (*Bromus inermis*): 1, one pound of seed as bought; 2, pure seed; 3, chaff and dirt; 4, spurious seeds; 5, total waste; 6, pure and germinable seed.

CRIMSON CLOVER, Trifolium incarnatum.

Crimson clover is generally of fair purity, but the buyer should never plant without testing for germination. A dark-colored sample should be rejected at any price. No. 1 of the table was so nearly worthless as to cost more than twice as much for a pound of good seed as was paid for a bushel. In this case the lowest-priced lot was the best to buy, the highest-priced the worst.

TABLE 7.—*Comparison of market price of crimson clover seed with price actually paid for the good seed.*

Sample number.	Market price, per bushel.	Per cent good seed.	Number of pounds good seed per bushel.	Price paid per bushel of good seed.
1	$5.75	0.82	0.49	$703.80
2	5.50	97.5	58.5	5.64
3	4.75	48.36	29	9.72
4	4.50	90.49	54.29	5.04

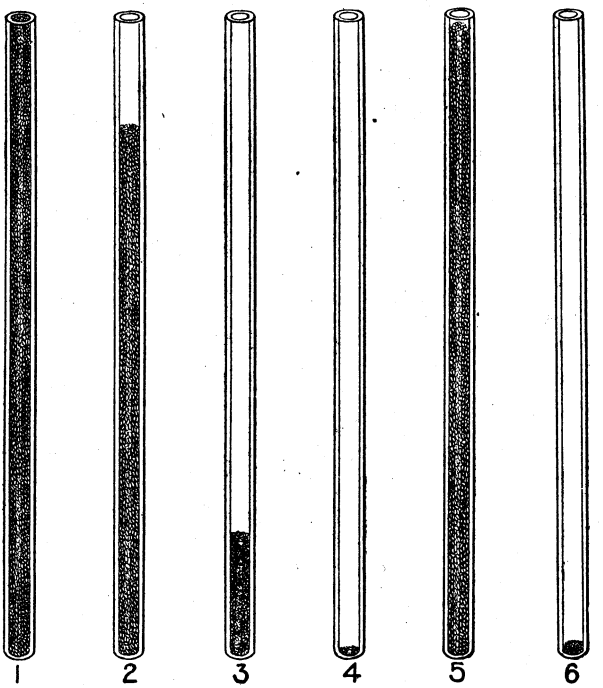

FIG. 6.—Crimson clover (*Trifolium incarnatum*): 1, one pound of seed as bought; 2, pure seed; 3 broken seed and dirt; 4, spurious seeds; 5, total waste; 6, pure and germinable seed.

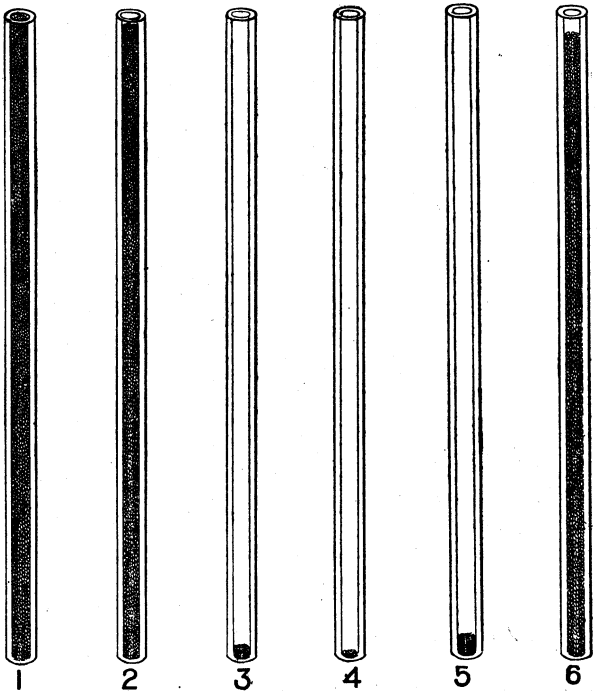

FIG. 7.—Crimson clover (*Trifolium incarnatum*): 1, one pound of seed as bought; 2, pure seed; 3, broken seed and dirt; 4, spurious seed; 5, total waste; 6, pure and germinable seed.

Figs. 6 (Sample No. 1 of Table 7) and 7 (Sample No. 2 of Table 7) illustrate the amounts of good seed and waste in two samples of commercial seed. Fig. 6 shows 1 pound of poor seed and fig. 7 1 pound of good seed. The price paid for 6 was $5.75 per bushel and for 7, $5.50 per bushel, but in order to secure 1 bushel of good seed out of the former lot a buyer would have had to purchase over $700 worth of the seed, while the latter lot actually cost only $5.64 per bushel of good seed.

REMISSNESS OF DEALERS IN SEEDS.

The above tables could be extended and additional ones could be given to show that the same conditions exist in the case of other agricultural seeds. Those given are enough, however, to demonstrate that seeds of grasses and forage plants are not commonly sold on their merits, and that too often neither seller nor buyer has a definite knowledge of the real value of the seed. Seeds are sold mostly by appearance, and in many cases this method proves satisfactory, but it often fails. The writer recently purchased a sample of crimson clover seed from a seedsman in Jacksonville, Fla. The seed was evidently not fresh, but seemed to be of fair quality. When tested, however, only 10 per cent germinated. Samples of beardless brome grass that looked like good seed were tested and found to contain from 15 to 40 per cent of a cheaper seed. Red clover is sometimes adulterated with yellow trefoil and the average individual can not tell the difference. Seedsmen are not infrequently deceived and sell seeds without knowing them to be poor. Perhaps no class of merchants know less about the quality of the goods they handle than do the small seed dealers about the seeds they sell. They know the more common seeds, and can tell whether clover seed is clean or very dirty, but beyond that their knowledge does not extend. They buy their stock under a certain name and sell it as such. Recently a package of orchard grass seed was bought from a Western dealer and it was found to contain no orchard grass whatever, but only English rye grass. It is probable that the dealer did not know one from the other. The farmer who buys from local dealers is, however, dependent upon the dealer for the quality of the seed, and it is he who suffers if the seed proves to be inferior. The dealer can readily say that the seed was good, but that the fault lay with the planting. This may or may not be true; the only way to know is to test the seed before planting.

HOW TO SECURE GOOD SEED.

FOUR POINTS REQUIRING ATTENTION.

As has been said, the remedy lies with the consumer. All legitimate demands in trade are bound to be met, and if purchasers will intelligently and persistently demand good seeds they will get them. When

trying to get good seeds four rules should be observed: Buy from reliable firms; avoid the cheap grades; demand a statement of quality in percentage; test the seed.

RELIABLE SEEDSMEN AND THE DEMAND FOR CHEAP SEED.

It is hardly necessary to insist that some seed dealers are more reliable than others. There are plenty of honest seedsmen in the United States and these aim to treat a customer fairly, but many of these firms have not an adequate knowledge of grass and forage plant seeds and are almost as liable to error as the purchaser himself. A firm that can be depended upon in the sale of grasses and clovers must not only be honest, but must have a special knowledge of the seeds it sells. Such firms usually offer their customers a fancy article and urge them to buy it in preference to the cheaper grades, but the latter must be handled because of the demand for them.

At a meeting of seedsmen, one of the number said that he had been advised to continue offering high-grade seeds although the demand did not seem to justify it, and these grades were not profitable. The reason given to him was that it would help his reputation, and that so long as people were foolish enough to buy low grades and tailings his profits would come from the sale of these low grades. It is true that seedsmen find less profit in the high grades than they do in the cheaper ones, and no dealer can afford to confine his trade to the former. He must keep what his customers demand. But how much more profitable for the customer to buy the high-grade seeds.

NEED OF STATEMENT OF PERCENTAGE OF GOOD SEED.

When the purchaser personally knows his dealer to be both honest and capable he may safely buy the high-grade seed offered. In most cases, however, these ideal conditions do not exist, and seeds are bought from dealers of whom little is known beyond their financial standing. It is in these cases—and they make up the bulk of the trade—that the percentage statement and subsequent test are useful.

In Europe many of the best firms have guaranty relations with seed-testing stations. They guarantee their seeds after these have been tested by the station, and the buyer has the privilege of having the seeds tested by the station free of cost. If the seeds fall short of the guaranty, the matter is settled according to the terms of the contract. There seems to be no reason why a guaranty should not be given in this country. Fertilizer laws indicate a concession that the farmer has a right to know exactly what he is buying. An analysis of seed is as easily made as one of fertilizers, and why should not the purchaser demand a guaranteed analysis of the seed he buys? It would, of course, be unreasonable to expect the same guaranty for all grades and prices, and some years it might even be impossible to offer seeds of the highest grades. Conditions of place and season must control every-

where, but the purchaser should have a chance to know just what the particular lot he buys is worth. This end might also be attained by securing a statement, without guaranty, of the purity and germination of the seed offered.

While guaranteed seed is undoubtedly the safest, its extra cost may at first render it unpopular and would greatly limit its use even if a guaranty could be obtained. However, by substituting a percentage statement of quality for the present vague and unreliable grade names, much would be done to protect the buyer and to expose those dealers who habitually sell inferior goods at slightly lower prices to catch the unwary.

The grade names in use at present generally mean nothing to the farmer and are quite misleading. If instead of "fair," "prime," "choice," or "fancy," clover-seed quotations were to read "pure and germinable seed, 60 per cent," "70 per cent," "80 per cent," "90 per cent," or whatever percentage of good seed of the kind named might be present, the purchaser could tell at once the relative value of every sample. These percentages could be based on tests made either by the seedsman or by the experiment stations.

Making these tests and keeping track of tested stock naturally involves some trouble, and to this many seedsmen object, but they should bear in mind that the preparation of land, purchase of seed, and loss of time involve much trouble and expense to the farmer, and he has a right to all protection that does not work injustice to the seedsmen. The demand for a percentage statement of quality does not involve such injustice, because the farmer only asks for definite information of the utmost importance to him about an article on which such information is readily obtainable by the seller.

THE NONWARRANTY CLAUSE AND COOPERATIVE BUYING.

It will, of course, be difficult to induce the members of the seed trade to abandon the time-honored nonwarranty clause, which exempts the dealer from all responsibility as to the character of the seeds sold. Whatever may be said as to the necessity of this clause in the sale of vegetable seeds, when grass and forage plant seeds are sold in quantity the purchaser has the right to know about the quality. The practical question is how to get the seedsmen to give a percentage statement in the absence of special laws requiring it. It is probable that the general demand of farmers, if determinedly and persistently made, will meet with success. The seedsman can not afford to ignore the just demands of his patrons, especially if the refusal means the loss of valuable orders. The pressure will be greater if all the seed used in a community is purchased through cooperation in one order. This method is now followed with success when it is desired to get lower prices than can be given on small orders, and might equally well be adopted when the object is to get seeds of known quality. It must not be overlooked,

however, that tested seeds of high quality will cost more than the common grades. Even if the quality is the same, the work of testing involves some expense and a purchaser should be willing to pay a shade more for seed when he is assured of the quality. Of course, unscrupulous dealers could still sell seeds under false pretenses, but it would be more difficult to shirk the responsibility; and a determination not to patronize a dealer who is persistently guilty of misrepresentation would soon make his position untenable.

TESTING OF GUARANTEED SEEDS IMPORTANT.

It has already been shown that the best seed to buy is that which is guaranteed free from injurious weed seeds and of which the price per pound of pure and germinable seed is the lowest. If the purchaser has any doubts about the seedman's statement, or feels that he would like to make sure of the quality of his seed before planting, he should send a sample to a seed-testing station. Whether seed is guaranteed or not, the most important thing is to have it tested. The risk involved in planting untested seeds is too great, especially when a considerable quantity is used.

TWO KINDS OF TEST NECESSARY TO THOROUGHNESS.

A complete test of a sample of seed consists of a purity test and a germination test. If the purchaser is satisfied about the purity of his seed, as he may readily be in the case of wheat, oats, or corn, a germination test should still be made. It is true that often much may be known of the vitality of seed from its color; for example, bright-colored crimson clover seed is pretty sure to germinate well, and dull-looking seed to germinate poorly. But in many cases no visible difference exists, and it is always safest to make the germination test. All seeds, except grasses, can be tested for germination at home as well as at a station, and farmers are urged to make these tests.

PRACTICAL DETAILS OF SEED TESTING.

A simple germinating apparatus can be made from two ordinary plates and a piece of flannel cloth. Fold the cloth and lay it in one plate, placing the seeds between folds of the cloth, which should be moist, but not dripping. Cover the whole with another plate inverted and stand in a warm place. If the test is made during cold weather, care must be taken to stand the plates where the temperature will not fall much below 50° Fahrenheit at night and will be about 65° or 70° during the daytime.

The seeds that have sprouted should be removed every day and the number recorded. When the test is completed the number of seeds sprouted can be compared with the number put in the test and the percentage of germination determined. Clover seeds, cereals, and timothy should be tested for about ten days, while other grass seeds need fourteen to thirty days.

OPPORTUNITIES FOR TESTING BY EXPERTS.

Purity tests and germination tests of grasses can be best made by experts. Many of the State experiment stations are prepared to test seeds, and the United States Department of Agriculture has a well-equipped laboratory for the same purpose. At this laboratory tests will be made free of charge, up to the limit of the facilities afforded, for all persons complying with the conditions. Full information concerning the seed is all that is asked. The name of the seller and the price paid must be given in every case, and it is desirable to know the year and place of growth, as well as any guaranty or claim of grade that may have been made for the seed. When this information accompanies the sample a report may be expected promptly.

IMPORTANCE OF CARE IN DRAWING THE SAMPLE.

Great care should be exercised in drawing the sample, as the value of the test depends largely upon the exactness with which this has been done. We often get samples containing about 2 thimblefuls of seed. Such samples are worthless for testing; the quantity should never be less than 1 ounce of the smallest seeds and 4 to 8 ounces of the larger kinds. The sample must fairly represent the entire bulk, and to do this it must be drawn from different parts of the mass. When a bag of seed, especially grass seed, has been sent some distance and has been shaken up by the jolting of the cars or the farm wagon when being brought from the freight depot to the barn the lighter seed and chaff tends to gather on top while the heavier seed settles to the bottom of the bag. If a sample were taken from the top of such a bag it would not fairly represent the lot; neither would one taken from the bottom. To get a fair sample the seed should be emptied upon a smooth floor and thoroughly mixed with a shovel. Small portions should then be taken from different parts of the heap, and these together make the sample. In case the quantity of seed bought is small it may be poured into a pail or other receptacle and small portions taken from time to time as the seed is poured out. When guaranteed seed is sent for test, especial care should be taken and a disinterested witness be present to sign the blanks that will be forwarded from the station.

It can not be too emphatically stated that *the value of the test depends largely upon the fidelity with which the sample represents the whole lot of seed.* No claim for damages could possibly be based on a test if it could be shown that the sample tested did not fairly represent the lot. With a carefully drawn sample, however, the station should be able to report the exact value of the seed and expose any adulteration or other fraudulent practices. The purchaser can then decide for himself whether or not the firm from whom the seed was bought is dealing fairly.

SUMMARY.

Dirty seed endangers the farm by introducing weed seeds. Low-priced seed is often poor seed, and it is then far more expensive than a high-priced good seed. The price of seed per pound or bushel is no accurate measure of its value; the true value is found by testing the sample and thus determining the per cent of good seed present. A statement of the percentages of purity and germination should be demanded whenever seeds are bought in quantity. As already stated, the Department of Agriculture is ready to test seeds and will report promptly on their real value.

FARMERS' BULLETINS.

These bulletins are sent free of charge to any address upon application to the Secretary of Agriculture, Washington, D. C. Only the following are available for distribution:

No. 16. Leguminous Plants for Green Manuring and for Feeding. Pp. 24. No. 19. Important Insecticides: Directions for Their Preparation and Use. Pp. 20. No. 21. Barnyard Manure. Pp. 32, figs. 7. No. 22. The Feeding of Farm Animals. Pp. 32. No. 23. Foods: Nutritive Value and Cost. Pp. 32, charts 2. No. 24. Hog Cholera and Swine Plague. Pp. 16. No. 25. Peanuts: Culture and Uses. Pp. 24, fig. 1. No. 26. Sweet Potatoes: Culture and Uses. Pp. 30, figs. 4. No. 27. Flax for Seed and Fiber. Pp. 16. No. 28. Weeds: And How to Kill Them. Pp. 32, figs. 11. No. 29. Souring of Milk, and Other Changes in Milk Products. Pp. 23. No. 30. Grape Diseases on the Pacific Coast. Pp. 15, figs. 3. No. 31. Alfalfa, or Lucern. Pp. 24, figs. 3. No. 32. Silos and Silage. Pp. 32, figs. 10. No. 33. Peach Growing for Market. Pp. 24, figs. 21. No. 34. Meats: Composition and Cooking. Pp. 29, figs. 4. No. 35. Potato Culture. Pp. 23, figs. 3. No. 36. Cotton Seed and Its Products. Pp. 16. No. 37. Kafir Corn: Characteristics, Culture, and Uses. Pp. 12, fig. 1. No. 38. Spraying for Fruit Diseases. Pp. 12, figs. 6. No. 39. Onion Culture. Pp. 31, figs. 3. No. 40. Farm Drainage. Pp. 24, figs. 6 No. 41. Fowls: Care and Feeding. Pp. 24, figs. 4. No. 42. Facts About Milk Pp. 29, figs. 8. No. 43. Sewage Disposal on the Farm, and Protection for Drinking Water. Pp. 20, figs. 8. No. 44. Commercial Fertilizers: Composition and Use. Pp. 24. No. 45. Some Insects Injurious to Stored Grain. Pp. 24, figs. 17. No. 46. Irrigation in Humid Climates. Pp. 27, figs. 4. No. 47. Insects Affecting the Cotton Plant. Pp. 32, figs. 18. No. 48. The Manuring of Cotton. Pp. 16. No. 49. Sheep Feeding. Pp. 24. No. 50. Sorghum as a Forage Crop. Pp. 20, fig. 1. No. 51. Standard Varieties of Chickens. Pp. 48, figs. 44. No. 52. The Sugar Beet. Pp. 48, figs. 24. No. 53. How to Grow Mushrooms. Pp. 20, figs. 14. No. 54. Some Common Birds in Their Relation to Agriculture. Pp. 40, figs. 22. No. 55. The Dairy Herd: Its Formation and Management. Pp. 24. No. 56. Experiment Station Work—I. Pp. 31, figs. 10. No. 57. Butter Making on the Farm. Pp. 15. No. 58. The Soy Bean as a Forage Crop. Pp. 24, figs. 5. No. 59. Bee Keeping. Pp. 32, figs. 19. No. 60. Methods of Curing Tobacco. Pp. 16. No. 61. Asparagus Culture. Pp. 40, figs. 17. No. 62. Marketing Farm Produce. Pp. 28, figs. 7. No. 63. Care of Milk on the Farm. Pp. 40, figs. 9. No. 64. Ducks and Geese: Standard Breeds and Management. Pp. 48, figs. 37. No. 65. Experiment Station Work—II. Pp. 32, figs. 7. No. 66. Meadows and Pastures in the Middle Eastern States. Pp. 28, figs. 9. No. 67. Forestry for Farmers. Pp. 48, figs. 15. No. 68. The Black Rot of the Cabbage. Pp. 22, fig. 1. No. 69. Experiment Station Work—III. Pp. 32, figs. 2. No. 70. The Principal Insect Enemies of the Grape. Pp. 23, figs. 12. No. 71. Some Essentials in Beef Production. Pp. 24, figs. 17. No. 72. Cattle Ranges of the Southwest. Pp. 32, figs. 9. No. 73. Experiment Station Work—IV. Pp. 32, figs. 3. No. 74. Milk as Food. Pp. 39, charts 2. No. 75. The Grain Smuts: How They are Caused and How to Prevent Them. Pp. 20, figs. 8. No. 76. Tomato Growing. Pp. 30. No. 77. The Liming of Soils. Pp. 19. No. 78. Experiment Station Work—V. Pp. 32, figs. 2. No. 79. Experiment Station Work—VI. Pp. 28, figs. 2. No. 80. The Peach Twig-borer: An Important Enemy of Stone Fruits. Pp. 16, figs. 5. No. 81. Corn Culture in the South. Pp. 24. No. 82. The Culture of Tobacco. Pp. 24. No. 83. Tobacco Soils. Pp. 23, fig. 1. No. 84. Experiment Station Work—VII. Pp. 32, figs. 8. No. 85. Fish as Food. Pp. 30. No. 86. Thirty Poisonous Plants. Pp. 32, figs. 24. No. 87. Experiment Station Work—VIII. Pp. 32, figs. 6. No. 88. Alkali Lands. Pp. 23, fig. 1. No. 89. Cowpeas. Pp. 16, fig. 1. No. 90. The Manufacture of Sorghum Sirup. Pp. 32, figs. 9. No. 91. Potato Diseases and Their Treatment. Pp. 12, figs. 4. No. 92. Experiment Station Work—IX. Pp. 30. No. 93. Sugar as Food. Pp. 27. No. 94. The Vegetable Garden. Pp. 24, figs. 8. No. 95. Good Roads for Farmers. Pp. 47, figs. 49. No. 96. Raising Sheep for Mutton. Pp. 48, figs. 18. No. 97. Experiment Station Work—X. Pp. 32, figs. 5. No. 98. Suggestions to Southern Farmers. Pp. 48. No. 99. Three Insect Enemies of Shade Trees. Pp. 30, figs. 11. No. 100. Hog Raising in the South. Pp. 40. No. 101. Millets. Pp. 28, figs. 6. No. 102. Southern Forage Plants. Pp. 48, figs. 14. No. 103. Experiment Station Work—XI. Pp. 32, figs. 5. No. 104. Notes on Frost. Pp. 24. No. 105. Experiment Station Work—XII. Pp. 32, figs. 4. No. 106. Breeds of Dairy Cattle. Pp. 48, figs. 21. No. 107. Experiment Station Work—XIII. Pp. 32, figs. 3. No. 108. Saltbushes. Pp. 20, figs. 9. No. 109. Farmers' Reading Courses. Pp. 20. No. 110. Rice Culture in the United States. Pp. 28. No. 111. The Farmer's Interest in Good Seed. Pp. 24, figs 7. No. 112. Bread and the Principals of Bread Making. (In press.) No. 113. The Apple and How to Grow It. Pp. 32, figs. 10.

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